Mathematics
Grade 4

2011

Maryland Common Core State Curriculum Framework

Adapted from the Common Core State Standards for Mathematics

Contents

Introduction

The Maryland Common Core State Standards for Mathematics (MDCCSSM) at the fourth grade level specify the mathematics that all students should study as they prepare to be college and career ready by graduation. The fourth grade standards are listed in domains (Operations & Algebraic Thinking, Number and Operations in Base Ten, Number and Operations – Fractions, Measurement & Data, and Geometry). This is not necessarily the recommended order of instruction, but simply grouped by appropriate topic.

How to Read the Maryland Common Core Curriculum Framework for Grade 4

This framework document provides an overview of the Standards that are grouped together to form the Domains for Grade Four. The Standards within each domain are grouped by topic and are in the same order as they appear in the Common Core State Standards for Mathematics. This document is not intended to convey the exact order in which the Standards will be taught, nor the length of time to devote to the study of the different Standards.

The framework contains the following**:**

- **Domains** are intended to convey coherent groupings of content.
- **Clusters** are groups of related standards**.** A description of each cluster appears in the left column.
- **Standards** define what students should understand and be able to do.
- **Essential Skills and Knowledge** statements provide language to help teachers develop common understandings and valuable insights into what a student must understand and be able to do to demonstrate proficiency with each standard. Maryland mathematics educators thoroughly reviewed the standards and, as needed, provided statements to help teachers comprehend the full intent of each standard. The wording of some standards is so clear, however, that only partial support or no additional support seems necessary.
- **Standards for Mathematical Practice** are listed in the right column.

Formatting Notes

- ***Black*** *– words/phrases from the Common Core State Standards Document*
- ***Purple bold*** *– strong connection to current state curriculum for this course*
- ***Red Bold****- items unique to Maryland Common Core State Curriculum Frameworks*
- ***Blue bold*** *– words/phrases that are linked to clarifications*
- ***Green bold*** *– standard codes from other courses that are referenced and are hot linked to a full description*

Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

1. Make sense of problems and persevere in solving them.
Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.
Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.
Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not

generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.
Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.
Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.
Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.
Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well-remembered 7 × 5+ 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single

objects or as being composed of several objects. For example, they can see $5-3(x-y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers *x* and *y*.

8. Look for and express regularity in repeated reasoning.
Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y-2)/(x-1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x-1)(x+1)$, $(x-1)(x^2+x+1)$ and $(x-1)(x^3+x^2+x+1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content
The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction. The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices. In this respect, those content standards which set an expectation of understanding are potential "points of intersection" between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Codes for Common Core State Standards (Math) Standards – K – 12

Grades K – 8		Applicable Grades
CC	Counting & Cardinality	K
EE	Expressions & Equations	6, 7, 8
F	Functions	8
G	Geometry	K, 1, 2, 3, 4, 5, 6, 7, 8
MD	Measurement & Data	K, 1, 2, 3, 4, 5
NBT	Number & Operations (Base Ten)	K, 1, 2, 3, 4, 5
NF	Number & Operations (Fractions)	3, 4, 5
NS	Number System	6, 7, 8
OA	Operations & Algebraic Thinking	K, 1, 2, 3, 4, 5
RP	Ratios & Proportional Relationship	6, 7
SP	Statistics & Probability	6, 7, 8
Modeling		
No Codes		Not determined
High School		
Algebra (A)		
A-APR	Arithmetic with Polynomial & Rational Expressions	8 -12
A-CED	Creating Equations	8 -12
A-REI	Reasoning with Equations & Inequalities	8 -12
A-SSE	Seeing Structure in Expressions	8 -12
Functions (F)		
F-BF	Building Functions	8 -12
F-IF	Interpreting Functions	8 -12
F-LE	Linear, Quadratic & Exponential Models	8 -12
F-TF	Trigonometric Functions	Not determined
Geometry (G)		
G-C	Circles	Not determined
G-CO	Congruence	Not determined
G-GMD	Geometric Measurement & Dimension	Not determined
G-MG	Modeling with Geometry	Not determined
G-GPE	Expressing Geometric Properties with Equations	Not determined
G-SRT	Similarity, Right Triangles & Trigonometry	Not determined
Number & Quantity (N)		
N-CN	Complex Number System	Not determined
N-Q	Quantities	Not determined
N-RN	Real Number System	8 -12
N-VM	Vector & Matrix Quantities	Not determined
Statistics (S)		
S-ID	Interpreting Categorical & Quantitative Data	8 -12
S-IC	Making Inferences & Justifying Conclusions	Not determined
S-CP	Conditional Probability & Rules of Probability	Not determined
S-MD	Using Probability to Make Decisions	Not determined
Modeling		
No Codes		Not determined

DOMAIN: Operations and Algebraic Thinking		
Cluster	**Standard**	**Mathematical Practices**
Use the four operations with whole numbers to solve problems.	**4.OA.1** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of **multiplicative comparisons** as multiplication **equations**. **Essential Skills and Knowledge** • **Knowledge of and ability to apply understanding of multiplication as repeated addition (2OA4), as "equal groups of" (3OA1), and the Commutative Property (3OA5)** **4.OA.2** Multiply or divide to solve word problems involving **multiplicative comparison**, e.g., by using drawings and **equations** with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from **additive comparison**. **Essential Skills and Knowledge** • **Ability to solve various types of problems involving multiplication and division (CCSS, Page 89, Table 2) through initial use of concrete materials and pictures, leading to the use of equations as a tool in solutions** **4.OA.3** Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

DOMAIN: Operations and Algebraic Thinking		
Cluster	**Standard**	**Mathematical Practices**
	Essential Skills and Knowledge • **Ability to apply knowledge of addition, subtraction, multiplication, and/or division appropriately to solve multi-step word problems through the use of equations** • **Ability to put the remainder in a division word problem in context and interpret it appropriately to determine if it should be discarded, replaced with the next highest whole number answer, or used as the answer to the question**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**
Gain familiarity with factors and multiples.	**4.OA.4** Find all **factor pairs** for a whole number in the range 1-100. Recognize that a whole number is a **multiple** of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range of 1-100 is **prime** or **composite**. **(SC 4)** **Essential Skills and Knowledge** • **Knowledge of multiplication as arrays and its connection to area of rectangles to determine factor pairs** • **Knowledge of and ability to apply multiplication facts to determine multiples of one-digit numbers** • **Ability to apply knowledge of basic multiplication facts to determine if products are prime or composite by determining all possible factor combinations for specific products**	
Generate and analyze patterns.	**4.OA.5** Generate a number or shape pattern that follows a given rule. Identify **apparent features** of the **pattern** that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*	

DOMAIN: Operations and Algebraic Thinking		
Cluster	**Standard**	**Mathematical Practices**
	(SC 4) **Essential Skills and Knowledge** • **Ability to apply knowledge of Growing Patterns versus Repeating Patterns using either numbers or shapes**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

<table>
<tr><th colspan="3">DOMAIN: Number and Operations in Base Ten (limited to whole numbers less than or equal to 1,000,000)</th></tr>
<tr><th>Cluster</th><th>Standard</th><th>Mathematical Practices</th></tr>
<tr><td>Generalize place value understanding for multi-digit whole numbers.</td><td>4.NBT.1
Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represent in the place to its right. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.
(SC 4)

Essential Skills and Knowledge
• Knowledge of place value from prior grades (2.NBT.1-4, 3.NBT.3)
• Knowledge of place value with whole numbers less than or equal to one million

4.NBT.2
Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
(SC 4)

Essential Skills and Knowledge
• See the skills and knowledge that are stated in the Standard.

4.NBT.3
Use place value understanding to round multi-digit whole numbers to any place.

Essential Skills and Knowledge
• See the skills and knowledge that are stated in the Standard.</td><td rowspan="2">1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.</td></tr>
<tr><td>Use place value understanding and properties of operations to perform multi-digit arithmetic.</td><td>4.NBT.4
Fluently add and subtract multi-digit whole numbers using the standard algorithm.

Essential Skills and Knowledge
• Knowledge of various types of algorithms (CCSS, Page 88, Table 1)</td></tr>
</table>

DOMAIN: Number and Operations in Base Ten (limited to whole numbers less than or equal to 1,000,000)		
Cluster	**Standard**	**Mathematical Practices**
	• **Ability to apply a standard algorithm in both addition and subtraction problems** **4.NBT.5** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the **properties of operations**. Illustrate and explain the calculation by using **equations**, **rectangular arrays**, and/or **area models**. **Essential Skills and Knowledge** • **Knowledge of the use of arrays area models for multiplication (3.MD.6 & 3.MD.7)** • **Knowledge of and ability to apply the Properties of Operations (CCSS, Page 90, Table 3)** **4.NBT.6** Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. **Essential Skills and Knowledge** • **Ability to apply knowledge of multiplication and division within 100 (3.OA.7)** • **Ability to use arrays and area models for multiplication and division (3.MD.6 & 3.MD.7).** • **Knowledge of and ability to apply the Properties of Operations (CCSS, Page 90, Table 3)**	1. **Make sense of problems and persevere in solving them.** 2. **Reason abstractly and quantitatively.** 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics.** 5. **Use appropriate tools strategically.** 6. **Attend to precision.** 7. **Look for and make use of structure.** 8. **Look for and express regularity in repeated reasoning.**

<table>
<tr><th colspan="3">DOMAIN: Number and Operations – Fractions (limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)</th></tr>
<tr><th>Cluster</th><th>Standard</th><th>Mathematical Practices</th></tr>
<tr><td>Extend understanding of fraction equivalence and ordering.</td><td>4.NF.1
Explain why a fraction a/b is equivalent to a fraction (n x a)/(n x b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

Essential Skills and Knowledge
• Ability to use concrete materials to model fraction number concepts and values
• Knowledge of and ability to generate simple equivalent fractions (3NF3b)

4.NF.2
Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as ½. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, <, and justify the conclusions, e.g., by using a visual fraction model. (SC 4)

Essential Skills and Knowledge
• Ability to apply knowledge factors (4OA4) to the strategies used to determine equivalent fractions as well as ordering fractions
• Ability to apply reasoning such as
— < – because 5 is not half of 20
• Ability to compare unlike fractions as stated in this Standard lays the foundation for knowledge of strategies such as finding the Least Common Multiple or the Greatest Common Factor</td><td rowspan="2">1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.</td></tr>
<tr><td>Build fractions from unit fractions by</td><td>4.NF.3
Understand a fraction a/b with a > 1 as a sum of fractions 1/b</td></tr>
</table>

DOMAIN: Number and Operations – Fractions (limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)		
Cluster	**Standard**	**Mathematical Practices**
applying and extending previous understandings of operations on whole numbers.	**Essential Skills and Knowledge** • **See 4NF3a-4NF3d for the skills and knowledge that are needed for this Standard.** **4.NF.3a** Understand addition and subtraction of fractions as joining and separating parts referring to the same whole **Essential Skills and Knowledge** • **Ability to use concrete and/or pictorial tools to add and subtract fractions with like denominators** • **Knowledge that the numerator tells how many parts of the whole we are counting and the denominator tells how many total parts there are in all** • **Knowledge that when counting parts of a whole, the numerator consecutively changes, the denominator stays the same (Example, –, –, –, – or 1)** • **Ability to use manipulatives to demonstrate that the denominator does not change when adding or subtracting fractions with like denominators** • **Ability to represent the addition and subtraction of fractions using concrete materials, pictures, numbers, and words** **4.NF.3b** **Decompose** a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition as an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8; 3/8 = 1/8 + 2/8; 2 1/8 = 1 + 1+ 1/8; 2 1/8 = 8/8 + 8/8 + 1/8.* **Essential Skills and Knowledge**	1. **Make sense of problems and persevere in solving them.** 2. **Reason abstractly and quantitatively.** 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics.** 5. **Use appropriate tools strategically.** 6. **Attend to precision.** 7. **Look for and make use of structure.** 8. **Look for and express regularity in repeated reasoning.**

DOMAIN: Number and Operations – Fractions (limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)		
Cluster	**Standard**	**Mathematical Practices**
	• **Ability to represent a whole number as a fraction (e.g.: 1 = –, –, etc.)** • **Ability to decompose fractions greater than one into whole numbers and fractional parts (3NF3c)** **4.NF.3c** Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using **properties of operations** and the relationship between addition and subtraction. **(SC 4)** **Essential Skills and Knowledge** • **Ability to change a mixed number into an improper fraction** • **Ability to add mixed numbers using a strategy such as adding fractions together and then adding the whole numbers together** • **Ability to subtract mixed numbers using a strategy such as replacing each mixed number with an equivalent fraction and then subtracting** **4.NF.3d** Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem. **Essential Skills and Knowledge** • **Ability to apply the understanding that the numerator tells us how many parts of the whole we are counting and the denominator tells us how many total parts there are** **4.NF.4**	1. **Make sense of problems and persevere in solving them.** 2. **Reason abstractly and quantitatively.** 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics.** 5. **Use appropriate tools strategically.** 6. **Attend to precision.** 7. **Look for and make use of structure.** 8. **Look for and express regularity in repeated reasoning.**

DOMAIN: Number and Operations – Fractions (limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)		
Cluster	**Standard**	**Mathematical Practices**
	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. **Essential Skills and Knowledge** • **Ability to use concrete materials to model multiplication of fractions** • **Knowledge that when multiplying a whole number by a fraction, you are finding that fractional part of the whole number (e.g.: – x 24 is the same as – of 24** • **Ability to connect the multiplication of fractions to the repeated addition of fractions (e.g.: 4 x – = – + – + – + –)** **4.NF.4a** Understand a fraction *a/b* as a multiple of *1/b*. *For example, use a visual fraction model to represent 5/4 as the product of 5 x (1/4), recording the conclusion by the equation 5/4 = 5 x (1/4).* **Essential Skills and Knowledge** • **Ability to apply the concept of a unit fraction in relationship to a multiple of that fraction (e.g.: – is the unit fraction of fourths)** **4.NF.4b** Understand a multiple of *a/b* as a multiple of *1/b, and use this understanding to multiply a fraction by a whole number*. *For example, use a visual fraction model to express 3 x (2/5) as 6 x (1/5), recognizing this product as 6/5. (In general, n x (a/b) = (n x a)/b.)* **Essential Skills and Knowledge** • **Knowledge that 3 x – = 3 groups of – or – + – + –**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

DOMAIN: Number and Operations – Fractions (limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)		
Cluster	**Standard**	**Mathematical Practices**
	4.NF.4c Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if a person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* **Essential Skills and Knowledge** • **Ability to apply knowledge of multiplication of fractions by a whole number to a variety of real life problem situations**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**
Understand decimal notation for fractions, and compare decimal fractions.	**4.NF.5** Express a fraction with denominator 10 as an **equivalent fraction** with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* **(SC 4)** **Essential Skills and Knowledge** • **Knowledge of this Standard provides a foundation for the relationship between fractions and decimals** **4.NF.6** Use decimal notation for fractions with denominators 10 and 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* **(SC 4)** **Essential Skills and Knowledge** • **See the skills and knowledge that are stated in the Standard.** **4.NF.7** Compare two decimals to hundredths by	

DOMAIN: Number and Operations – Fractions (limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)		
Cluster	**Standard**	**Mathematical Practices**
	reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, <, and justify the conclusions, e.g., by using a visual model. **Essential Skills and Knowledge** • **Ability to apply knowledge of place value as a strategy to compare decimals**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

DOMAIN: Measurement and Data		
Cluster	**Standard**	**Mathematical Practices**
Solve problems involving measurement and conversion of measurements for a larger unit to a smaller unit.	**4.MD.1** Know relative sizes of measurement units within one system of units including km, m, cm, kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), 3, 36), …* **(SC 4)** **Essential Skills and Knowledge** • **Knowledge of capacity units should also include cups, pints, quarts, and gallons.** • **Knowledge of length units should also include inches, feet, and yards.** • **Ability to use visual aids with conversion of measurement** **4.MD.2** Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. **Essential Skills and Knowledge** • **Ability to use visual aids with conversion of measurement** • **Knowledge of systems of measurement, fractions, decimals, and equivalent units of measurement** **4.MD.3** Apply the area and perimeter formulas for rectangles in real world and mathematical	1. **Make sense of problems and persevere in solving them.** 2. **Reason abstractly and quantitatively.** 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics.** 5. **Use appropriate tools strategically.** 6. **Attend to precision.** 7. **Look for and make use of structure.** 8. **Look for and express regularity in repeated reasoning.**

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	problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formulas as a multiplication equation with an unknown factor.* **(SC 4)** **Essential Skills and Knowledge** • **Ability to apply knowledge of the relationship between area and perimeter through the exploration of rectangles with the same area but different perimeters or rectangles with the same perimeter but different areas** • **Ability to apply knowledge of factors, finding an unknown factor in an equation, and the relationship between multiplication and area**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**
Represent and interpret data.	**4.MD.4** Make a **line plot** to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.* **Essential Skills and Knowledge** • **See the skills and knowledge that are stated in the Standard.**	
Geometric measurement: understand concepts of angle and measure angles.	**4.MD.5** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. **(SC 4)** **Essential Skills and Knowledge** • **See 4MD5a-4MD5b for the skills and knowledge that are needed for this Standard.** **4.MD.5a** An angle is measured with reference to a circle	

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Cluster	**Standard**	**Mathematical Practices**
	with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of the circle is called a "one-degree angle," and can be used to measure angles. **Essential Skills and Knowledge** • **Knowledge of partitioning circles into equal shares (2G3)** • **Ability to relate understanding of equal shares of a circle to angles** • **Ability to use visual aids and/or technology to apply the understanding of how a circle is divided into 360 degrees (e.g., circle protractor or geometry software)** • **Introduce the unit of measurement of a circle (degrees). Students need to understand that a whole circle is 360 degrees by taking a circle and dividing it into – – – etc. so that – is 360 divided by 2, – Is 360 divided by 4, etc.** **4.MD.5b** An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. **Essential Skills and Knowledge** • **Knowledge that each angle measure is a result of how much of the circle is covered (e.g., shading in 50 parts of the 360 would equal a 50 degree angle)** **4.MD.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. **Essential Skills and Knowledge** • **See the skills and knowledge that are stated in the Standard.**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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Cluster	**Standard**	**Mathematical Practices**
	4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. **Essential Skills and Knowledge** • **Ability to apply knowledge of common whole number addition and subtraction situations to fractional problem situations (CCSS, Page 88, Table 1)** • **Ability to use manipulatives to model the solution to the problem.**	**1. Make sense of problems and persevere in solving them.** **2. Reason abstractly and quantitatively.** **3. Construct viable arguments and critique the reasoning of others.** **4. Model with mathematics.** **5. Use appropriate tools strategically.** **6. Attend to precision.** **7. Look for and make use of structure.** **8. Look for and express regularity in repeated reasoning.**

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Cluster	**Standard**	**Mathematical Practices**

DOMAIN: Geometry		
Cluster	**Standard**	**Mathematical Practices**
Draw and identify lines and angles, and classify shapes by properties of their lines and angles.	**4.G1** Draw **points**, **lines**, **line segments**, **rays**, **angles (right, acute, obtuse)**, **and perpendicular and parallel lines**. Identify these in **two-dimensional figures**. **(SC 4)** **Essential Skills and Knowledge** • **This is the first time these terms are introduced.** • **Ability to apply a deep understanding of this vocabulary will assist with drawing and identifying these shapes within two-dimensional figures.** **4.G.2** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. **Essential Skills and Knowledge** • **Ability to use concrete materials to model the lines and angles of two-dimensional figures to provide visual evidence of the relationship between various figures** **4.G.3** Recognize a **line of symmetry** for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	1. **Make sense of problems and persevere in solving them.** 2. **Reason abstractly and quantitatively.** 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics.** 5. **Use appropriate tools strategically.** 6. **Attend to precision.** 7. **Look for and make use of structure.** 8. **Look for and express regularity in repeated reasoning.**

	Essential Skills and Knowledge • **See the skills and knowledge that are stated in the Standard.** • **This is the first exposure to symmetry in the Common Core.**	